Worksheet 3 Types of processor Answers

Task 1

1. Using standard von Neumann architecture, instructions and data both share the same memory space.

Memory	
Address	**Instruction / Data**
0	10010111 00101111
1	
2	00000000 11010100
…	…
255	00000000 01001010

One problem with this model is that the CPU can either be reading an instruction or reading/writing data to or from memory, but not both at the same time since instructions and data use the same bus system, which is a performance limitation.

(a) Name another architecture that resolves this issue. How does it differ from von Neumann architecture?

Harvard architecture – this has separate memories for instructions and data. Separate data buses transfer instructions and data to and from memory

(b) What other advantages are there of using this architecture?

Avoids data erroneously overwriting programming instructions in the same address location;

Data cannot be executed as code;

Can employ larger data or instruction memory as required // memory address structures do not need to be the same;

Data and instructions can have different word lengths;

Instructions can be held in cheaper ROM, data in more expensive RAM

(c) What are the advantages of von Neumann architecture over Harvard architecture?

In Von Neumann architecture you can use free memory for data/instructions. In Harvard architecture the data and instructions are separate and neither can use the others memory locations.

Simpler Control Unit design means it is cheaper to build computers with von Neumann architecture

2. Complete the following text by using the words an phrases given below to fill in the gaps.

CISC stands for Complex instruction Set Computer. In this technology, the instruction set consists of a large number of instructions, each designed to execute a series of sub-tasks that make up a single instruction. Because the code is relatively short, very little RAM is needed to store the instructions.

RISC stands for Reduced Instruction Set Computer. This type of computer uses a small instruction set, and each instruction can be performed in one clock cycle. This means that pipelining is possible, and performance is at least as good or better than CISC.

Cheap RAM has contributed to the prevalence of this technology in almost all modern desktop computers.

pipelining short large clock cycle performance very little sub-tasks instruction instruction set Complex Instruction Set Computer small RAM RISC

Task 2

1. Compare co-processor and parallel processor systems. (Note that "compare" means describe similarities and differences.)

Common features:

- More than one processor working together to perform a single job
- Job is split into tasks / in a multicore system, different processors may work on different tasks
- Processors are controlled by a single operating system
- Job is completed more quickly.

Differences:

- Parallel processors can use any processor for a task
- Co-processor performs specific types of task only, e.g. floating point arithmetic or graphics processing so the job is only completed more quickly if task isappropriate.

- Parallel processors need a more complex operating system / harder to program
- Parallel processors are synchronised